4-4: Clean development mechanism policy and sustainable rural development in China (4: Strategies for sustainable society)

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Clean development mechanism policy and sustainable rural development in China

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4-4-1 Introduction

China's economic growth has been rapid since its economic reform and open-door policy of 1978. It tries to maintain an 8 per cent annual growth rate in the face of the worldwide economic downturn by ramping up government spending. On the other hand, it has been experiencing serious environmental pollution resulting from rapid industrialization and urbanization. In response, the central government has gradually initiated countermeasures, starting with a programme to combat water pollution in the Huai River basin in 1994.

Despite such efforts, the environmental problems are still serious. In addition, greenhouse gas (GHG) emission has been continuously rising. The average annual rate of increase since 1995 is approximately 8 per cent; the rate has exceeded 10 per cent since 2000 when economic growth accelerated again. In particular, the amount of CO_2 (carbon dioxide) emissions from electricity generation and heat has increased at an average annual rate of 15.7 per cent for the 11 years from 1995 to 2006 (Figure 4.4.1). As a result, in 2005 the amount of GHG emissions in China surpassed that in the United States, and it became the world's largest emitter (Figure 4.4.2). Moreover, China's CO_2 emission, which was ranked number two in the world in 2006, became number one in 2007.

Continued increase in GHG emissions in China is not only attributed to economic growth and an accompanying rise in energy consumption: lack of clear emission reduction targets and clear policies to achieve them

Achieving global sustainability: Policy recommendations, Sawa, Iai and Ikkatai (eds), United Nations University Press, 2011, ISBN 978-92-808-1184-1

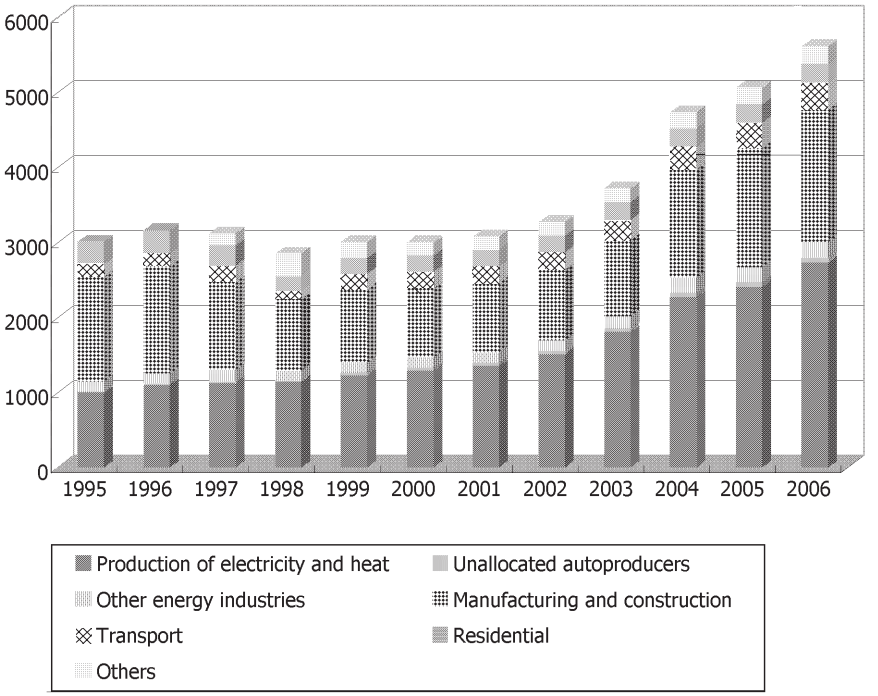

Figure 4.4.1 CO_2 emissions in China by sector, 1995–2006
Source: IEA (2009).

might have given little incentive for local governments and firms to reduce GHG emissions.

Even in such a policy climate, efficient energy use, greater use of renewable energies and the clean development mechanism (CDM) have been implemented to overcome the vicious cycle of increasing reliance on coal, inefficient energy supply and air pollution (Mori, 2011). The CDM is a mechanism in which the Annex I countries under the Kyoto Protocol organize projects to reduce emissions or increase sequestration by providing developing countries with technical or financial assistance, and count a certain portion of the resulting GHG reductions as part of what the Annex I countries themselves must achieve.

This "flexible" mechanism is established as a complement to reduce GHG emissions in Annex I countries. However, it is criticized for concentration in specific types of projects and specific nations, and little consideration for sustainable development in developing countries. To use the CDM as a tool for advancing sustainable development, SouthSouthNorth (2003) and Sutter and Parreño (2007) argue ways to improve its institutions.

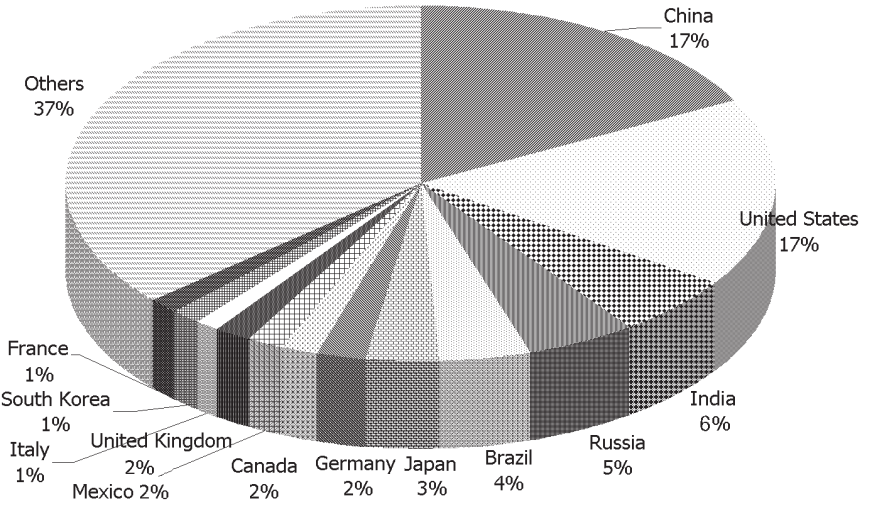

Figure 4.4.2 World greenhouse gas emissions, 2005
Source: OECD (2008).

The World Wildlife Fund proposed the Gold Standard that labels high-quality certified emissions reductions (CERs) in the carbon market. China has shown interest in contributions to sustainable development that CDM projects would make. However, the more emphasis developing countries put on such contributions, the less support from Annex I countries, which leads to few investments.

Assuming a trade-off between GHG reduction and sustainable development in host countries, domestic policies in the host country may have a large impact on the magnitude of contributions that CDM projects make to sustainable development. This chapter examines this potential by investigating a biogas CDM project for small-scale pig farms in rural areas, and agricultural policies in China.

4-4-2 CDM policy in China

In the 1990s the Chinese government was very cautious about the negotiation of the UN Framework Convention on Climate Change (UNFCCC): it may have mandated GHG reduction even in developing countries, including China, which would hinder its domestic economic growth. China judged that maintaining a representative role among the developing countries opposing such obligations (the G-77) would work advantageously in international politics (Kobayashi, 2002).

Once the CDM rules and regulations were specified at the UNFCCC Seventh Conference of the Parties, however, the Chinese government began to examine the effect of the CDM with support from the World Bank. Consequently, it recognized that the CDM would bring the country five benefits: an increase in net foreign direct investment amounting to US$475 million; improved efficiency in generation and consumption of electricity; a 0.5 per cent rise in GDP through investment in advanced technology and increased domestic production; development of local economies through technology transfers and tax revenues; and increased efficiency in energy use and the use of waste resulting from electricity generation (Nygard et al., 2004). With such research results, the country started to recognize that proactive use of the CDM would enable the achievement of policy goals such as stable energy supply and efficient use of energy.

In addition, the UNFCCC and the Kyoto Protocol take the principle of "common but differentiated responsibility", stating that they do not oblige developing countries to reduce GHG emissions. Hence, China ratified both the UNFCCC and the Kyoto Protocol in hope of additional funds from the Global Environment Facility as well as technological transfers and fund inflows through the CDM (Zhang, 2002).

China then announced the Interim Measures for the Operation and Management of CDM Projects in 2004 and the Measures for the Operation and Management of CDM Projects in 2005, declaring the government would actively promote CDM projects. It also announced a critical notification regarding the standardization of CDM projects, consulting services and evaluation activities in China.

Further, the government formulated China's National Climate Change Programme in 2007 to show targets, basic principles, focal areas and policy measures for climate change activities by 2010. As a goal of GHG emission reduction, the programme clearly states an increase of the share of renewable energy, including large-scale hydroelectric power plants in primary energy supply going up to 10 per cent and an increase in the extraction of coal-bed methane to 10 billion m^3, alongside a 20 per cent reduction in energy consumption per unit of GDP relative to its 2005 level described in the Eleventh Five-Year Plan. The programme also outlines a reduction of GHG emissions in 2010 by 200 million tonnes of CO_2-equivalent through coal-bed and coalmine methane CDM projects, and by 30 million tonnes of CO_2-equivalent through the promotion of biomass energy. The government is planning to have a target to improve energy consumption per unit of GDP by 17 per cent in the Twelfth Five-Year Plan (2011–2015).[1] By publicizing these active measures and plans globally, the Chinese government intends to avoid an obligation to reduce

emissions in a post-2012 international framework for preventing climate change.

4-4-3 Features of CDM policy in China

There are three main features in CDM policy in China. First, it stipulates that profits made through transfers of CERs belong to the Chinese government and CDM project entities. Based on this provision, the Chinese government has a legal right to collect its share of revenue from the sales of CERs.

Second, the difference in the treatment of preferred and non-preferred subsectors in CDM projects is remarkably large. Three subsectors – improvement of energy efficiency; renewable energy; and recovery of methane, coal-bed methane and coalmine methane – are designated as key and receive preferential treatment in various procedures, plus tax of only 2 per cent of the revenue from the sales of CERs. In contrast, the government's share in the revenue from CER sales is set higher for hydrochlorofluorocarbon (HFC-23) and nitrous oxide (N_2O), at 65 and 30 per cent, respectively.

Third, entry by foreign entities is strictly restricted. The government limits the entities permitted to enter CDM projects to Chinese companies and firms with a Chinese holding company having 51 per cent or more of their shares. Reflecting this restriction, many CDM projects are proposed without a merger or technology partnership with a foreign company, and applications sent to the Chinese government or the CDM executive board for approval indicate that the participation of foreign companies tends to be limited to CER purchases.

4-4-4 The current state of CDM projects in China

China has become the nation with the largest number of CDM projects and amount of CERs. The number of CDM projects in China registered with the United Nations has drastically risen since 2007. As of May 2009 it had 564 registered projects, which surpassed India's 428 projects and dwarfed Brazil's 158. The amount of GHG emission reduction by 2012 rises to 887.86 million tonnes of CO_2-equivalent for China – almost four times the amount for India (Table 4.4.1).

This rapid increase is partly attributed to a unique feature of CDM projects in China. Until 2007 the majority of CERs came from HFC-23 reduction schemes that produced a large amount of CERs per project

Table 4.4.1 Number of CDM projects and volume of CERs by host country

	Number of projects	CERs up to 2012 (million tonnes of CO_2-equivalent)
China	564	888
India	428	239
Brazil	158	134
Mexico	114	48
Malaysia	46	17
Chile	32	29
South Korea	27	95
Indonesia	24	19
Argentina	15	27
Others	240	161
Total	1,648	1,657

with low project risks, and were thus regarded as the most cost-efficient CDM projects. However, no more HFC-23 reduction projects are expected to be proposed because all the feasible projects from existing factories producing HCFC-22 have been approved, and the UNFCCC Conference of Parties decided that it would no longer approve the reduction of HFC-23 from any new HCFC-22 producing factories. Subsequently, the reduction of nitrous oxide at factories and the recovery of coal-bed and coalmine methane are attracting attention due to perceived higher cost-effectiveness with lower risks.

CDM projects were also encouraged by the enactment of the Renewable Energy Law of the People's Republic of China in 2006. This law defines renewable energy as non-fossil (e.g. wind, solar, biomass, geothermal and ocean) energies, and does not include direct burning of straw, firewood or excreta in low-efficiency stoves. The law also states that the central government encourages renewable energies in rural areas, and that energy offices of local governments (above prefecture level) and relevant bureaucratic divisions must prepare plans for renewable energy development in rural areas and provide technical and financial support for the use of biogas from biomass, household solar energy and small-scale wind turbines and hydropower, taking into account different conditions in each region. Also, as a measure to promote renewable electricity, a *de facto* feed-in tariff is introduced to mandate power grids to conclude agreements to purchase all the renewable electricity generated by companies that obtain a government permit or are registered through submitting a report. If a grid operator does not purchase all the electricity, it faces a fine with an upper limit of twice the amount of economic losses sustained by power generation companies. The price for biomass electric power paid by the grid is set at an amount equalling each province's

Table 4.4.2 Sectoral allocation of number of CDM projects and volume of CERs in China

	Number of projects	CERs up to 2012 (million tonnes of CO_2-equivalent)
HFC reduction	11	366
N_2O reduction	26	103
Cement	3	3
Methane recovery	37	77
Methane avoidance	2	0
Afforestation	1	0
Fuel change	14	69
Waste gas and heat	63	70
Hydropower	267	118
Wind power	125	72
Biogas	3	1
Biomass	11	9
Other renewable energy	1	0
Total	564	888

2005 standard purchasing price for grid-produced electricity from desulphurized coal-fired plants plus 0.25 yuan/kWh. This led to a rapid increase in the number of CDM projects in renewable energy, including small-scale hydropower and biogas as well as wind power (Table 4.4.2).

Wind power and small-scale hydropower projects, however, do not necessarily improve the environment or advance sustainable development in the communities near the project site. They may cause noise problems and changes in land use, including the expropriation of farmland, and generated power is not always distributed at a price affordable to communities, thus perhaps worsening their standard of living.[2]

On the other hand, small-scale biogas or biomass projects are more likely to bring about the supply of electricity and gas to communities, a resulting decrease in deforestation, suppressed respiratory diseases due to reduced use of firewood and coal, and improvement in indoor pollution. Thus they have greater potential for improving the quality of life. Paying attention to these sustainable development impacts, the Chinese government has encouraged installing methane gas digesters for livestock at individual farms by providing a subsidy of 800 yuan per installation since 2000, when it entirely banned deforestation. The government provided an annual subsidy of 20–30 million yuan before 2000; this increased to 100 million yuan in 2000, 1 billion yuan in 2003 and 2.5 billion yuan in 2006 – a 100-fold increase. Despite this effort, in Hunan province, for example, only 30–40 out of 122 prefecture and district governments could obtain the subsidy annually, and the number was just 10–20 for county

and village governments. These figures show that diffusion has been much slower than planned.[3]

The government therefore attempted to promote the existing measure by redesigning it as a CDM project and obtaining additional revenue from the acquisition of CERs. Two biogas CDM projects for pig farms were registered with the UNFCCC by June 2009: one is targeted at relatively large specialized pig farms; the other is for installing biogas digesters at rural small farms, which we examine in the following section.

4-4-5 Potential of a livestock-waste CDM project for sustainable rural development: The case of Enshi Tujia and Miao autonomous prefecture

The Eco-farming Biogas Project for Enshi Tujia and Miao autonomous prefecture, Hubei province, is designed to install biogas digesters at 33,000 farming households located in nationally designated impoverished areas in two county-level cities (Enshi and Lichuan) and six counties (Xuanen, Jianshi, Badong, Xianfeng, Laifeng and Hefeng) that are constituents of a prefecture in a poverty-stricken mountainous region. The project aims to reduce methane gas emissions by installing digesters to supplement the use of coal, and expects to cut the amount of GHG emission by 580,000 tonnes of CO_2-equivalent during a 10-year credit period. The biogas digesters used in this project are, in principle, those specified in the technological standards set by the Chinese government, and planning and construction are provided by engineers certified by the Ministry of Agriculture; there is no technology transfer from the Annex I countries.

As shown in the feasibility study for a CDM project in Dingcheng district in Changde city, Hunan province, biogas CDM projects for pig farms can produce large net benefits not only for the entire project but also for farmers, because they enable farmers to reduce expenditures due to the substitution for fossil fuel and chemical fertilizer and saving time that would have been used for collecting firewood or charcoal (Table 4.4.3). The study also shows that there is no incentive for private entities to invest in such projects because, assuming that they bear most of the investment costs, they cannot recover these. In order for private entities to recover their costs, project design must be adjusted so that farmers pay at least a portion of the investment. However, the initial cost is higher than farmers' annual income, while benefits are rather intangible – in the form of expenditure reductions. Therefore, farmers tend to perceive their own burden as higher and benefits as lower. In addition, the more remotely farmers are located from urban areas, the less opportunity they have to

Table 4.4.3 Cost-benefit matrix for the biogas CDM project at Chandu city, China (yuan)

	Project initiator	Farmer	Central government	Total
Revenue				
CER	908	0	19	927
Saving of fossil fuel	0	4,698	0	4,698
Saving of chemical fertilizer	0	5,813	0	5,813
Time saving	0	8,618	0	8,618
Cost				
Construction	1,600	0	800	2,400
Maintenance	0	0	0	0
Transaction	1,000	0	0	1,000
Profit	–1,692	19,129	–781	16,656

Notes:
CER price is assumed as US$10 per tonne of CO_2-equivalent.
Discount rate and credit period are assumed as 10 per cent and 10 years respectively.
Transaction cost is discussed in Michaelowa et al. (2003).

find a part-time job, which makes it difficult for them to take advantage of time saving by earning more income. Time saving may turn into additional leisure time, or give an incentive for young farmers to work in a large coastal city for long periods, leaving farming to the elders. In the latter case, installed biogas digesters do not get used sufficiently. For this reason farmers are reluctant to install digesters, even if the government provides a subsidy of 800 yuan, let alone bear part of the investment costs.

The Eco-farming Biogas Project for Enshi Tujia and Miao tries to overcome this challenge, being a CDM project led by local government. The project has four characteristics. First, farmers should bear construction and maintenance costs of biogas digesters. Second, to reduce the burden of initial investment costs borne by farmers, the credit union of the local government sets up a finance programme with the government's CER revenue as collateral. Third, to prevent insufficient maintenance by farmers to allow assured acquisition of CERs, the project operating entity, not farmers, does the actual installation and maintenance and receives compensation from farmers. Fourth, a project management office is established in the local government to utilize CER revenue to enhance technical assistance and instruction to village governments. According to the project design document, these measures can produce a positive net benefit for farmers and the entire project, and enable the project entity to recover costs even though benefits associated with time saving do not arise (Table 4.4.4).

Table 4.4.4 Cost-benefit matrix for the biogas CDM project at Enshi Tujia and Miao autonomous prefecture, China (yuan)

	Project initiator (local government)	Farmer	Central government	Total
Revenue				
CER	947	0	20	967
Saving of fossil fuel	0	4,698	0	4,698
Saving of chemical fertilizer	0	5,813	0	5,813
Cost				
Construction and maintenance	0	2,085	1,000	3,085
Reserve for write-off	<947	0	0	<947
Profit	>0	8,426	–980	>7,445

Notes:
CER price is assumed as US$10 per tonne of CO_2-equivalent.
Discount rate and credit period are assumed as 10 per cent and 10 years respectively.
Transaction cost is assumed as zero with consideration to the local-government-initiated CDM project, while collateral is counted on as a reserve for write-off.
Savings of fossil fuel and chemical fertilizer are assumed to be the same as Table 4.4.3, while time saving is assumed to be zero due to few opportunities to get part-time jobs.

This project is, however, merely government coercion to achieve its policy goal of diffusing biogas digesters in which it installs biogas digesters first, and forces farmers to pay compensation for the cost afterwards. In order to pay compensation, a farmer has two options: sustain operation of biogas digesters to save enough from reduced use of coal, briquettes and chemical fertilizers; or let young generations work in large cities for a period long enough to earn income exceeding the amount of loan repayment. The former choice increases the risk of pests emerging due to the transition to organic fertilizers in circumstances where a farmer cannot expect increased productivity by expanding farm size (Takahashi, 2009). There is also a risk of not getting biogas if swine influenza spreads.[4] To avoid such risks, farmers continue to use fossil fuel and chemical fertilizers and are not inclined to install biogas digesters, nor completely replace production and consumption as shown in Table 4.4.4. The latter choice depends on the availability of jobs in large cities.

If farmers cannot repay their loan, they have no choice but to sell their right to use land to large agricultural corporations in the process of liquidating their assets.[5] Traditionally, land-use rights have been the last resort that have guaranteed work and subsistence-level living for farmers with

no social security from the government. Farmers who have sold their land-use right become employed workers without social security, and are more dependent on their employers and more vulnerable to external conditions (Shimizu, 2005).

We can draw two findings from this case. First, small-scale livestock-waste CDM projects can be financially viable only when the government can build institutions that prohibit farmers from migration in the current context of China. Second, farmers can improve their living standard only when they can manage various kinds of risks, including price fluctuations for their agricultural products and natural disasters.

4-4-6 Agricultural policies and sustainable development

Since the establishment of the People's Republic of China, the government has discriminated against farmers through policies and institutions, such as the policy to keep agricultural prices low and prohibition of urban migration under the household registration system. The repressed agricultural price was abolished in 1980 and there was official acceptance of the sale of surplus harvest, which increased farmers' income in the 1980s. But agricultural prices fell drastically in the 1990s because of excessive production. Land has been segmented and productivity reduced since 1980, because farmland area has decreased while the agrarian population has continued to grow. Underdeveloped distribution systems, such as lack of a credible appraisal mechanism, insufficient functioning of price adjustment systems and weak storage capability reflected in the lack of storage space and refrigerators, make it difficult for farmers to sell their products at the most favourable terms (ibid.). As a result, farmers' absolute income has declined after a peak in 1997 (Shimizu, 2006).

To supplement agricultural income, many farmers have a second job at medium- or small-scale companies or work as manual labourers for long periods. However, the household registration system makes it difficult for farmers to move to large cities to obtain urban household registration that would give them access to various public services there. Central government developed a plan to abolish the differentiation between agricultural and non-agricultural (urban) household registration in approximately five years from 2000 and put an end to the planned management of farmers' transfer to small cities. Accordingly, in 2001 several provinces ended rural and urban household registration and unified them into resident household registration. However, since the government of a large city can set its own conditions for issuing permits to incoming migrants, the acquisition of an urban household registration is still difficult. Therefore, types of jobs that incoming farmers can find are limited to contract labour at factories or manual labour with high risks and severe working

conditions, such as construction work. Such jobs provide minimal wages and do not offer social insurance. Knowing that only unstable and risky jobs are available, farmers working in a city do not sell their land-use right, thereby securing their living. Hence, no agricultural productivity improvement is potentially gained by expanding the scale of production, while more farmland is left unattended and barren. In addition, no group to represent the interests of farmers is allowed to organize, and the proportion of farmers in the population is small compared to that of bureaucrats in the People's Congress: there are few institutions that incorporate farmers' opinions into policy-making processes (Korogi, 2005).[6]

To make CDM projects advance sustainable development in rural areas, it is necessary to modify the existing policies further to overcome the problems of farmers, rural areas and agriculture. As a first step, it is important to establish political institutions that reflect the opinions of farmers, and allow farmers, without regard to their type of household registration, to receive the same public services enjoyed by urban people, such as social security, healthcare and education.[7]

Such reforms have been advanced, however, only in policy areas that central government can deal with by increasing public expenditure. Redistribution policies such as property tax, inheritance tax and the establishment of a social security fund have not been realized because of disagreements within the Communist Party, backed by fierce opposition from wealthier people. Also, a stamp tax hike for stock transactions, which was passed in 2007, was cancelled to prevent stock prices falling at the beginning of 2008.

In addition, there seems to be no end to forced expropriations and development of land by local governments, ignoring environmental impact assessments and farmers' resistance to such actions. The forced land expropriation is pushed by the fact that local governments receive far greater income from property development than from taxes, and heads and officials of local governments are evaluated by economic performance in their jurisdiction. To mitigate the latter incentive, central government is debating the use of an integrated environmental and economic indicator such as green GDP as an index for performance evaluation. In reality, however, only three environmental indicators are taken into account: total amount of sulphur dioxide emissions, total amount of chemical oxygen demand discharge and energy consumption per unit of GDP. Environmental deterioration caused by forced expropriations and land redevelopment is not properly taken into account: rather, these actions receive high marks in economic performance indicators.

When these problems are overcome, a greater number of CDM projects in rural areas would be proposed and implemented, providing ideas and opportunities for promoting sustainable development in these areas.

4-4-7 Conclusion

This chapter has shown that the Chinese government became active in CDM projects after recognizing these would advance the sustainable development that the country wants to realize. It has promoted biogas projects for small-scale pig farms as a way of promoting renewable energy and preventing deforestation, as well as reducing poverty in rural areas. Recently, a CDM project was introduced to diffuse biogas digestion to small-scale farmers over a wider area. Despite the project's potentially large positive net profit, uptake is slow due lack of profitability to project developers and financiers, high installation costs to farmers and their migration to cities as contract or manual labourers. To ensure profits to them and sustainability of the project, local governments have to implement the project by themselves, provide loans to farmers and recover the costs, as seen in the case of Enshi Tujia and Miao. This chapter finds that this is due mainly to farmers' perceived substantially high risks, which are ascribed not only to the size of initial investments but also to institutions that discriminate against farmers, such as the existing agricultural policies, the household registration system and a performance evaluation system that cannot reduce local governments' appetite for development nor provide incentives to promote environmental preservation actively.

Notes

1. *Jiji Tsushin*, 17 June 2009 (www.jiji.com/jc/zc?k=200906/2009061700048).
2. In Shanwei, Guangdong province, there was a protest by farmers opposing land expropriation for a wind power plant, which was subsequently quelled by a large-scale police action (Shimizu, 2006: 350–352).
3. Interview at Hunan Province Development and Reform Commission, March 2006.
4. Swine influenza emerged in vast area of China during the period 2005–2006, forcing many farmers to sell their hogs at a low price. According to an interview conducted by the author and other researchers in Liuan, Anhui province, in 2007–2008 swine influenza was one of the major reasons why farmers abandoned small-scale farming and hog farming and went to large cities for long-term work.
5. All land in China is state owned. However, the Property Law of 2007 allows automatic continuation of a land-use right after its predetermined lease period ends, as well as its sale and purchase.
6. This is due to the disparity in the ratio of representatives per head of population in urban and rural areas. It was decided in 1992 that one representative for the National People's Congress should be elected for every 960,000 people in rural areas and for every 240,000 people in urban areas,
7. The tax reform implemented in Anhui province reduced the "unreasonable" fees on farmers by simplifying various fees. However, it led to shortage of revenues for local governments despite the 20 billion yuan subsidies from the central government. This delayed and stopped salary payments to schoolteachers and made the operation of com-

pulsory education in rural areas difficult. As a result, such reforms did not spread nationwide (Yan, 2002).

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